Center Innovation Fund: LaRC CIF

Flexible Composites for Space

Completed Technology Project (2014 - 2015)

Project Introduction

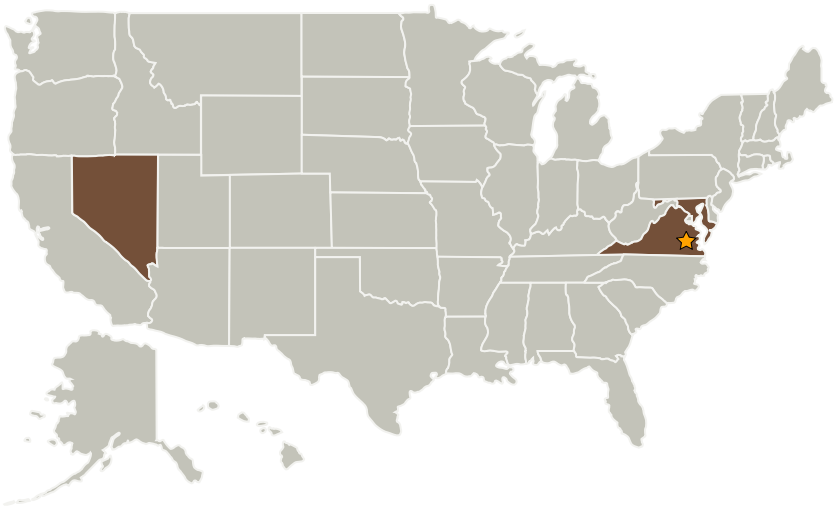
Payload mass reduction and packaging efficiency in launch vehicles are essential for deep space exploration. Inflatable softgoods have been identified as attractive approaches to meet these needs. Applications include crew habitation and collapsible airlocks (in-space and on planetary surfaces), and inflatable decelerators for planetary entry systems. However, heritage softgoods approaches are based on woven, crimped fabric. The new idea is to replace woven fabric softgoods with flexible composites made from non-carbon fibers and flexible matrix resins that were originally developed for racing sailboats. This new approach will decrease the engineering development time and cost, and also enable mass reductions from the heritage approach.

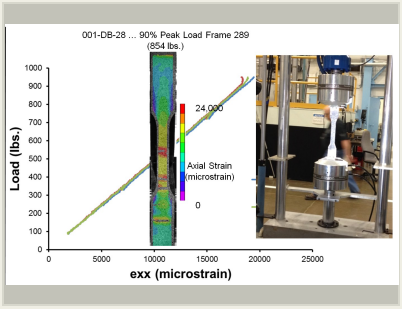
A number of flexible composite layups were considered, fabricated, and tested under static tension to evaluate stiffness, stress-strain behavior, failure loads, and failure characteristics. Results will be published and comparisons will be made to a woven structure approach for a space habitat in a planned NASA TM.

Anticipated Benefits

Utilizes SOA composite fabrication techniques, provide a more consistent and predictable structural response compared to woven structures, lower required factors of safety and lower mass, better integration to standard composite structures

Primary U.S. Work Locations and Key Partners





Typical test set up and test data from tension test of flexible composite

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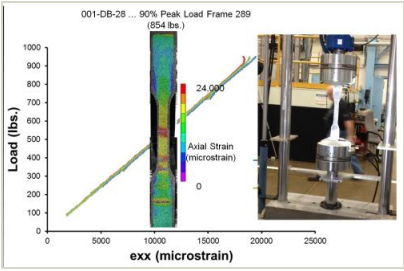
Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Army Research Lab(ARL)	Supporting Organization	US Government	Adelphi, Maryland
north sails	Supporting Organization	Industry	

Primary U.S. Work Locations	
Maryland	Nevada
Virginia	

Images



tension test of flexible composite
Typical test set up and test data from tension test of flexible composite
(https://techport.nasa.gov/image/18373)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Center / Facility:
Langley Research Center (LaRC)

Responsible Program:
Center Innovation Fund: LaRC CIF

Project Management

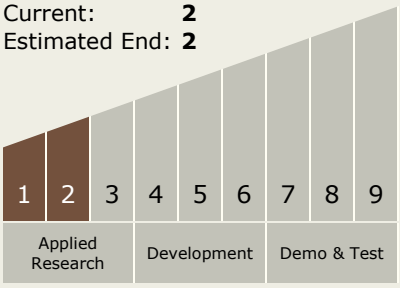
Program Director:
Michael R Lapointe

Program Manager:
Julie A Williams-byrd

Principal Investigator:
Stephen J Scotti

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.3 Flexible Material Systems